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ABSTRACT

The ability of 64 mildly mentally retarded students (10-17 years old) to judge the structural importance of idea units in prose was measured, and the relationship between the judgment of importance and the patternings of recall was compared. Ss were randomly assigned to one of five groups which were presented with a passage containing units with differing levels of structural importance and stimulus saliency. Treatment conditions differed as a function of whether students were given advance notice of the later recall task, whether importance ratings were required, and whether emphasis was given to the potential usefulness of the ratings in aiding recall. Analysis of variance indicated that Ss were significantly better at identifying low and medium importance units than in identifying units of high importance. Analysis also revealed a main effect for the treatment condition. Recall was highest for the group which received advance notice of later recall, made importance ratings, and received strong emphasis on the potential usefulness of importance. Units rated as high in importance were recalled significantly better by the mentally retarded learners than medium or low importance units. It was concluded that mentally retarded learners could use differing importance levels in text to aid in recall provided that the learners were repeatedly instructed to differentiate among such levels. (Author/CL)

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IDENTIFICATION AND RECALL OF STRUCTURALLY IMPORTANT UNITS IN VERBAL DISCOURSE AS A FUNCTION OF THE METACOGNITIVE PROCESSING OF MENTALLY RETARDED CHILDREN

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ABSTRACT

Luftig, Richard L. Ph.D., Purdue University, August 1980. Identification and recall of structurally important units in verbal discourse as a function of the metacognitive processing of mentally retarded children. Major Professor: Ronald E. Johnson.

This study investigated the ability of mentally retarded students to judge the structural importance of idea units in prose. In addition, experimental comparisons were made of the relationship between the judgments of importance and the patternings of recall. Sixty-four mentally retarded students ranging in chronological age from 10 to 17 years and in IQ from 50 to 73 were randomly assigned to one of five groups. The groups were presented with a passage which contained units differing in levels of structural importance and stimulus saliency. It was hypothesized that the mentally retarded learners would have difficulty in assessing the importance of the ideational units. It was also predicted that the ability to identify important units would be positively related to story recall.

The treatment conditions differed as a function of whether students were given advance notice of the later recall task, whether importance ratings were required, and whether emphasis was given to the potential usefulness of the ratings in aiding recall. It was hypothesized that differential task instructions would lead to differential metacognitive functioning as inferred from recall of structurally important units.

Analyses of variance indicated that the mentally retarded pupils

were significantly better at identifying low and medium importance units than in identifying units of high importance. Analysis also revealed a main effect for the treatment condition. Recall was highest for the group which received advance notice of later recall, made importance ratings, and received strong emphasis on the potential usefulness of importance. Units rated as being high in importance were recalled significantly better by the mentally retarded learners than medium or low importance units. It was concluded that the mentally retarded learners could use the differing importance levels in text to aid in recall provided that the learners were repeatedly instructed to differentiate among such levels. Implications for further research on the comprehension processes of the mentally retarded were discussed.

CHAPTER I

INTRODUCTION

Educators and psychologists have long been interested in the cognitive processes by which people comprehend and recall connected discourse. Investigations of prose comprehension and recall (e.g., Frase, 1969; Freidman & Greitzer, 1974; Johnson, 1974; Perlmutter & Royer, 1973) have suggested that what is remembered is influenced both by text organization and recognition of that organization by the reader. Thus, explanations of what constituted a good reader have often been predicated on the reader's ability to recognize and utilize text structure so as to optimize recall (Danner, 1976).

Unfortunately, understanding of comprehension and recall processes has been obtained by studying mature language processers. The result is that our knowledge of reading processes in younger, less mature comprehenders is incomplete. Thus, qualitative differences between good and poor readers and between young children and older children are just beginning to be investigated (e.g., Christie & Schumacher, 1975; Danner, 1976; Brown & Smiley, 1977; Smirnov, 1973). Meyer (1975) and Johnson (1970) have identified three problems which have contributed to a dearth of prose comprehension studies. These problems have been described as (1) difficulties in assessing the organizational structures of the passages (Johnson, 1970), (2) difficulties in assessing the attributes and processes which

constitute comprehension (Campione & Brown, 1977; Meyer, 1975), and (3) difficulties in understanding the control processes used by the learner in comprehending prose (Atkinson & Shiffrin, 1973).

The problem of identifying variables that influence text organization has affected attempts to develop prose passages which are equivalent (Johnson, 1970). According to Meyer (1975), past investigations of text structure have centered around surface structure analyses, readability, sentence length, sentence vocabulary, and vocabulary density (Chall, 1958; Fry, 1972; Heilman, 1968; Spache, 1953). More recent analyses of prose, however, indicate that such surface structures and featural attributes are quickly lost from memory (Sachs, 1967). Instead, what appears to be remembered from prose are the main ideas and the gist of the presentation (De Villiers, 1975; Johnson, 1970; Sachs, 1967). Recent investigations of memory for prose have studied semantic variables such as content structure (Kintsch, 1974, 1975; McKoon, 1975), the sequence in which ideas are learned (Johnson & Scheidt, 1977), hierarchical relationships between idea units in a passage (Meyer, 1975, 1977), and the relative importance which raters assign to ideas in a passage (Brown & Smiley, 1977; Johnson, 1977). According to Offir (1973), investigations of semantic variables in prose hold more promise for understanding prose memory processes than surface structure analyses (e.g., Chomsky, 1965; Katz & Postal, 1964). In keeping with this position, the present paper will be concerned with the semantic and organizational attributes of prose rather than grammatical and syntactical attributes.

The problem of defining the components of comprehension has relevance for an understanding of how readers glean information and

remember text materials. Behaviors which have been used to infer comprehension have included subjective reporting by the reader as to whether a passage has been comprehended (Carroll, 1972; Danks, 1969; Kershner, 1964), supplying missing elements of messages (Bormuth, 1968; Greene, 1975; Taylor, 1953), and the paraphrasing and transforming of the text message into a new form (Carroll, 1970; Downey & Hakes, 1968). According to Carroll (1972), it is difficult to separate variables which influence comprehension from variables which influence memory. Thus, Carroll asserted that trying to separate comprehension processes from memory processes may be an impossible task. Carroll's positions will be discussed further in the literature review.

The adequate description of the control processes which a reader uses in comprehending and recalling discourse is also important in understanding what is remembered from prose (Campione & Brown, 1977; Flavell & Wellman, 1977). Atkinson and Shiffrin (1968) have distinguished between control processes and structural features in memory. According to Atkinson and Shiffrin, structural features refer to the invariant and unmodifiable components of memory. Fisher and Zeaman (1973), similarly, have defined structural memory features in children as processes of memory that cannot be modified. According to Campione and Brown (1977), a control process may or may not be used at the discretion of the comprehender. Campione and Brown (1977) identified the essential difference between structural features and control processes as the susceptibility to training. Control processes are considered to be trainable while structural features are not.

An outgrowth of the dichotomy between structural features and control processes is the hypothesis that memory deficiencies in young children and mentally retarded individuals may be caused by failures to exercise appropriate cognitive strategies (Flavell & Wellman, 1977; Kail, 1979; Wellman, Drezdal, Flavell, Salatas, & Ritter, 1975). For example, Kail (1979) has suggested that a major reason for poor memory performance on some tasks by preschool and kindergarten children is a relative insensitivity on the part of these children to limitations of their memory systems. Furthermore, Kail asserted that these children cannot appropriately distinguish between different types of information which may influence memory. According to Kail, children often inappropriately utilize the same strategies for a wide variety of memory tasks. Likewise, research investigating message organization, elaboration, and rehearsal by retarded individuals has indicated that the retarded also demonstrate strategy deficiencies which inhibit comprehension and recall (Br wski & Wanschura, 1974; Brown, Campione, & Murphy, 1974; Kellas, Ashc , & Johnson, 1973; Murphy & Campione, 1974). These hypothesized deficiencies in strategies constitute a major area of interest in the current paper.

The research conducted in this thesis investigated the ability of mentally retarded students to utilize particular control process in comprehending and recalling prose. Although memory processes of retarded individuals have been studied in the past (e.g., Denny, 1964, 1967; Ellis, 1967), most studies have been conducted with nonsemantic stimuli. Thus, very little is known about memory for discourse by retarded individuals. However, recent findings reported by Brown (1977) and Campione and Brown (1977) indicate that memory deficiencies in the

retarded may be identified and possibly remediated. If this is the case, then one particular memory deficiency of the retarded may be their failure to use the structural importance of ideas as a basis for organizing learning and recall. Furthermore, it may be that skills in identifying and remembering important idea units can be taught to retarded learners.

The literature review which follows is a discussion of relevant theory and research as it applies to comprehension and recall of prose by young normal children and mentally retarded individuals. Included will be a discussion of processes involved in prose comprehension, structural importance and its relationship with recall, hypothesized organizational deficiencies of mentally retarded individuals, and the construct of metacognition and its effect on memory.

CHAPTER II

REVIEW OF THE LITERATURE

Processes of Discourse Comprehension

What are the cognitive operations that constitute the comprehension of discourse? Carroll (1972) has operationally defined comprehension as a multi-dimensional process which operates on the levels of vocabulary, grammatical features, and other text characteristics. Carroll argues that for comprehension to occur, the language receiver must apprehend the information contained in the discourse and then relate that information to whatever context is available at the given time. Thus, according to Carroll, comprehension entails at least two distinct stages; appropriate apprehension of linguistic information contained in a message and the connection of linguistic information to a wider context.

Like Carroll, Davis (1968) has suggested that comprehension is a multi-dimensional process which encompasses a hierarchy of operations which range from surface structure decoding to semantic structure decoding. Davis factor analyzed various measures of comprehension into factors of lexical knowledge, grammatical knowledge, remembering word meanings, following the structure of a passage, locating facts in paragraphs, finding answers to questions discussed in the passage,

drawing inferences from what is read, and recognizing a writer's purpose, attitude, tone, and mood. Davis concluded that these eight types of behavior constituted independent components of comprehension, and that the absence of such skills would result in comprehension deficiencies. Thus, it would appear that both Davis (1968) and Carroll (1972) would agree with Miller's assertion that knowing the meaning of a string of words does not guarantee that the word string will be comprehended. That is, the sum total of the word meanings in that string is not always equal to the meaning of the whole phrase when the word meanings are put together into a coherent phrase.

Bormuth (1970) has developed a theory of comprehension which differs from Carroll's (1972). According to Bormuth, comprehension of discourse is reflected in a person's ability to perform grammatical transformations on text sentences. For example, given the sentence; "A very old man who lives up the street led his dog up to a store window one day," comprehension would be assumed to exist if the reader could correctly answer questions such as; "Who led the dog?," "What did the man lead?," and "Where does the man live?".

These questions appear almost ludicrously simple and one might predict that even the youngest and most inexperienced comprehender would be able to answer them correctly. However, Bormuth, Manning, Carr, and Pearson (1970) in a study of normal fourth grade children, found that a significant proportion of the children were unable to answer the questions correctly. The authors concluded that this deficiency had serious implications for the efficiency of classroom instruction.

Clark (1973), Clark and Card (1969), and Trabasso (1972) have hypothesized models of comprehension in which the reader attempts to relate new information contained in the message to the reader's existing contextual information of how the world operates. According to Clark (1973), comprehension is successfully obtained when new information can be readily attached to older information contained in long term-memory. When information cannot be attached to the contents of memory, comprehension is said to be difficult or impossible.

Freedle (1972) has proposed that comprehension involves the larger task of grasping the speaker's message. That is, according to Freedle, comprehension is the process of ascertaining the main topic of a passage. According to Freedle, as the speaker or writer shifts from one topic to another and back again, he cues topical shifts by special communicative devices such as topic sentences and the utilization of key phrases which appear at the beginning of paragraphs. Furthermore, Freedle asserts that by attending to these cues or "vital units," the listener reduces the possible set of alternatives from what the speaker might be referring to to what is the actual topic.

Olson (1970, 1972) views comprehension in ways similar to Freedle (1972). According to Olson (1972), comprehension is a process of "mapping" discourse onto perceptual contexts. In the Olson model, a speaker and receiver successfully communicate when the receiver can differentiate an object or an alternative. According to Olson, a sentence is comprehended or not comprehended relative to context. This context is specified by perceptual cognizance of the

described situation or by the context of the preceeding situation. Sentences compatible with their contexts are easily processed and comprehended. On the other hand, sentences not compatible with context must be brought into contextual and perceptual correspondence by recoding either the context or the sentence.

In summary, current models of comprehension assert that the understanding of discourse is not found in the spoken or written words themselves but rather in the semantic context of the message (Freedle and Carroll, 1972). Furthermore, the receiver of the message is expected to possess prior knowledge or contextual information so as to encode the message correctly. Thus, to comprehend discourse, the listener assumes that the message "makes sense" and exhibits a consistency in terms of what the receiver assumes to be true about how the world operates (Fillmore & Langendoen, 1971). This emphasis on context and listener presupposition represents a distinct movement from earlier theories of comprehension which emphasized syntactic and surface structure influences in understanding discourse (Chall, 1958; Fry, 1972; Heilman, 1968; Spache, 1953).

Structural Importance: The Rating of Idea Units in Prose

Recent investigations of prose have clearly indicated that the semantic relationship between ideas in a passage is important in understanding memory for discourse. For example, Johnson (1970), Meyer (1975), and Carter (1977) have shown that what is remembered from prose is significantly related to what is important and unimportant in the text. Furthermore, Johnson (1970) has demonstrated

that raters and learners are sensitive to differing levels of text importance and that ideational units of high importance are remembered best.

Prior to 1970, there was a paucity of studies assessing effects of text organization on memory. According to Johnson (1970), this was caused in part by difficulties in quantifying and calibrating passage organization. Johnson (1970), however, devised methodology for assessing the importance levels of idea units in passages. In the first step, raters divided a folktale into units of "pausal acceptability" by indicating where a pause might be appropriate in allowing a reader to "catch a breath, give emphasis to a story, or enhance meaning." After the story was subdivided, additional raters were told that "linguistic phrases differed in their structural importance to the whole story and that some phrases could be eliminated without destroying the essence of the story." Raters then eliminated pausal units of the story until 3/4, 1/2, or 1/4 of the original story remained. The number of times which a unit remained in the story thus was an index of the structural importance of the unit. Johnson found that regardless of the number of words deleted by raters, the rank ordering of idea units was quite similar. Finally, when other learners attempted to recall the story after delays of 15 minutes, 7 days, 21 days, or 63 days, recall was found to be a direct function of structural importance. Based on comparable outcomes in several experiments, Johnson (1970) concluded that: "Repeated confirmations of the relationship between structural importance and recall, under a variety of experimental conditions, attest to the durability of the relationship... Regardless of the experimental variations, a substantial

relationship was found between structural importance and recall."

Similar to Johnson's (1970) method of identifying important and unimportant idea units in text, Meyer (1975, 1977) and Meyer and McConkie (1973) have devised a method by which the semantic content of a passage can be placed into a hierarchical structure. This content hierarchy, which Meyer (1977) has labeled "content structure," identifies ideas in a passage as being subordinate or superordinate. As described by Meyer (1977), "Some ideas from a passage are located at the top levels of content structure, others are found at the middle levels, and still other ideas are found at the bottom levels of the structure. Most of the ideas located at the top levels of the content structure have many levels of ideas beneath them and related to them in a direct downward path in a structure. These top level ideas dominate their subordinate ideas. The lower level ideas describe or give information about the ideas above them in the structure".

Meyer and her associates have shown that information high in content structure is better remembered than information low in content structure. For example, Meyer (1971, 1977) and Meyer and McConkie (1973) instructed groups of college undergraduates to listen to two 500-word passages extracted from Scientific American. Ideas were divided into groups of high, medium, and low based on their level in the content structure of the passage. In addition, Ss heard the passage once, twice, or three times prior to attempting recall. Meyer (1977) found that for both passages, under all three presentation conditions, units high in content structure were recalled more frequently than units low in content structure. Replications of the experimental results were obtained when concreteness/abstractness was controlled and

when Ss were children rather than adults. Meyer and her associates concluded that Ss used the content structure of a passage in recalling the passage. Furthermore, Meyer (1977) asserted that the Ss attended closely to the top level structure of the passage, remembering the primary relationships of the passage. Meyer hypothesized that the reason that the low content structure was not remembered more readily was because the low level material was not maintained through rehearsal in short-term memory nor processed into long-term memory at deeper semantic levels (Craik & Lockhart, 1972). Thus, the peripheral clusters of unimportant information was selectively dropped from memory. This hypothesis of selective forgetting has also been advanced by Gomulicki (1956) and Johnson (1974b) in their finding that certain types of prose units at different importance levels are much more likely to survive in memory.

Parenthetically, it is interesting to speculate as to whether deeper processing of high level information and selective forgetting of low level information are control processes which are under the control of the learner. Johnson (1974b) has shown that college students show accuracy in predicting which ideas units are likely to be remembered. Thus, the possibility exists that a good comprehender may be able to selectively and accurately use text organization in order to optimize recall. Furthermore, it may be that one difference between good and poor comprehenders (e.g. young children vs. older children or normal individuals vs. retarded individuals) lies in the good comprehender's ability to perceive differing levels of structural importance and to use that information in a facilitative manner. If so, it may be possible to train Ss to use such control processes and

thereby optimize their own recall.

In another study investigating structural importance and text organization in prose, Rickards and August (1975) investigated underlining strategies in prose comprehension and recall. Rickards and August found that the underlining of structurally important ideas was the "natural inclination" of college subjects. In the Rickards and August study, college students either generated their own underlinings (one sentence per paragraph) or had a sentence already underlined for them by the experimenters. The underlines of the experimenters were either important or unimportant as judged by the Johnson (1970) rating procedure. Rickards and August found that readers who did their own underlining and who had been instructed to underline important material, recalled more important material and more underlined material than any other group. Conversely, readers who were directed to underline unimportant material showed the worst performance. Rickards and August concluded that it was not the process of underlining per se which facilitated or interfered with performance, but rather whether or not the underlined material was important. A further conclusion was the the underlining of unimportant material was an unnatural comprehension strategy which ran counter to the ways in which good comprehenders normally process prose.

Similar to the findings of Rickards and August, Brown and Smiley (1977) and Smiley, Oakley, Worthen, Campione, and Brown (1977) demonstrated that children had a higher probability of recalling an idea unit when that unit was high in structural importance. For example, Smiley et al. had good and poor readers from seventh grade classes read one passage and listen to a second. Following passage

presentations, the children were tested for comprehension and recall. Smiley et al. found that good readers recalled more of the passage than poor readers. For both groups of readers, the probability of a unit being recalled was a positive function of the structural importance of that unit, but the recall patterns of the good readers more closely corresponded with differences in structural importance.

Smiley et al. hypothesized that the ability to remember the structurally important units of prose was a facilitative one for comprehension and recall. Furthermore, they concluded that the poor readers in their study were deficient in comprehension skills as well as word decoding skills and that the two skills were operating independently of one another. Finally, they concluded that differential sensitivity to structural importance existed when the passage was presented auditorily as well as graphically. Thus, according to Smiley et al., poor readers in the study suffered from a general comprehension deficit in that these readers did not spontaneously utilize a strategy of differentiating levels of importance.

In a study similar to Smiley et al., Brown and Smiley (1977) had children of four age groups (8, 10, 12, or 18 years) rate prose units for structural importance and then attempt to recall the passages. Brown and Smiley reported that although there was considerable agreement between the 18-year olds and the 12-year olds on which were the important and unimportant units, the 8- and 10-year old subjects were unable to reliably differentiate the units by structural importance. Despite the younger children's inability to rate the units reliably, however, the younger children still remembered significantly more of the important units. Based on these findings, the authors argued that

the young children did not abstract from the passages what was important even though they were not able to demonstrate differential memory based on levels of structural importance.

The question may be raised as to what features of prose influence comprehension and recall. Olson (1970), for example, has proposed a theory of message comprehension which is in part based on the saliency of the message units. According to Olson, poor comprehenders may use a reverse strategy where they respond to what is unimportant and peripheral but which nevertheless captures their attention.

Kintsch and Bates (1977) have offered evidence supporting the Olson hypothesis. Kintsch and Bates had college students listen to a lecture which contained units high in structural importance, units of detail which were low in structural importance, and irrelevant but highly salient units such as jokes and announcements. On subsequent tests of recall after five days, the students demonstrated greatest memory for the non-important but highly salient material. Thus, even for college students, the actual pattern of recall ran counter to what one might think would be recalled by students accustomed to being tested on important material.

DeVilliers (1974) demonstrated that the variable of imagery also influenced the recall of prose. By imagery, it is meant the concrete, imaginable, picturable phrases which conjure up mental pictures in the reader's mind. DeVilliers found that if sentences presented were perceived as a story, the extent to which the sentence was rated as being central to the theme of the story was highly correlated with degree of recall. However, if the sentences were not perceived as a story, the imagery of the phrase was the greatest predictor of sentence

recall. Similar findings demonstrating the importance of imagery in prose recall have been reported by Johnson (1974) and Yuille and Paivio (1969).

Clearly, it appears that there are competing factors vying for readers' attention during attempts to comprehend prose. That is, a person could attempt to recall discourse on the basis of structural importance, concreteness, imagery, meaningfulness, interest, etc. Additionally, it appears that cognitive strategies may differ in their effectiveness in facilitating memory, depending on such factors as the depth of processing (Craik and Lockhart, 1972) and the anticipated future use of processed material (Carroll, 1971). However, the strategy of abstracting and recalling important material while paying less attention to unimportant (but potentially salient) material has proved to be a facilitative strategy in almost all comprehension situations (Gibson & Levin, 1975; Rickards & August, 1975; Smiley et al., 1977). This selective attention process will be further discussed in the section which deals with the mentally retarded learner.

Information Processing in Mentally Retarded Individuals: General or Organizational Deficits?

Rothkopf (1968, 1970, 1972) has identified learner processing behaviors as a crucial variable in determining whether a passage will be comprehended. According to Rothkopf (1971), emphasis on the control processes of the comprehender is more important in predicting comprehension and recall than emphasis on structural variables related to textual content. These processing behaviors, termed by Rothkopf

(1971) as "mathemagenic" behaviors, are seen by him as the key to an understanding of comprehension processes.

The question may be asked as to the information processing and/or mathemagenic behaviors which mentally retarded individuals bring to learning situations. In particular, it is of psychological interest to investigate whether a retarded individual can utilize organizational differences in text to optimize comprehension and recall.

Prose experiments with retarded subjects have been rare, but the limited available data suggest that both the attention to relevant but nonsalient stimulus dimensions in text and the use of appropriate organizational strategies play a role in retardate learning. For example, Blackman, Bilsky, Burger, and Mar (1976) examined the potency of twenty-seven variables in predicting the reading achievement of mentally retarded learners. Factor analysis reduced the set of twenty-seven variables to six main factors. Using these six factors as independent predictors, a stepwise multiple regression was carried out. Blackman et al. found that the best predictor of retardate reading achievement was a memory factor. This memory factor included the separate indices of digit span, category clustering, active rehearsal, memory for words and sentences, and paired associate learning. Of these indices identified within the memory factor, digit span, clustering, rehearsal, and sentence memory have been identified by other investigators as processes which facilitate memory (Brown, 1977; Belmont & Butterfield, 1977; Flavell, 1977; Hagen & Stanovich, 1977).

Blackman et al. argue that a retarded individual's sensitivity to appropriate memory strategies is of central importance in the comprehension and recall of discourse. They found that mentally retarded individuals

often failed at cognitive tasks when they did not see the organization inherent in those tasks. When the memory task was experimentally structured so as to make the appropriate strategy more noticeable, an additional number of retarded subjects became strategy users. Blackman et al. concluded that besides the ability to learn and subsequently use a comprehension strategy, a prerequisite skill needed to comprehend discourse materials was the capacity to be sensitive to strategy relevant organizational structure embedded in the text.

Blackman and Burger (1972), in a study predating Blackman et al. (1976), evaluated variables in the areas of perception, learning, cognition, memory, and language abilities as predictors of reading achievement in mildly retarded and normal children. Factor analysis was used to reduce 19 variables in the above mentioned areas to six factors which were 1) a visual-perceptual factor, 2) an auditory-perceptual factor, 3) word knowledge, 4) conceptualization skills, 5) memory, and 6) general learning ability. Blackman and Burger found that the memory component factor held the greatest potential in being a predictor of retardate reading achievement. They reported that the nonretarded readers were significancly better at utilizing this memory factor in reading than their counterparts even though both groups relied heavily on the factor. Thus, according to Blackman and Burger, the ability to comprehend prose by retarded learners was closely related to a memory component which, as they demonstrated in their later study (Blackman et al., 1976), was under the control of the reader as a comprehension strategy.

The question may be raised as to whether retardate memory failures are due to deficiencies in structural capacities or to failures of the

learner to exercise proper control processes (Atkinson & Shiffrin, (1968). Spitz (1966), for example, has argued that retardate memory failures are not due to a disfunctioning of the comprehension and recall apparatus but rather from a deficient ability to organize input into meaningful, rememberable units. Thus, according to Spitz, mentally retarded individuals are the victims of an organizational deficit which inhibits their "making sense" out of the perceptual stimuli which they take in. According to Spitz, since retarded individuals do not organize incoming stimuli efficiently, the world that they inhabit must be extremely chaotic.

If the retarded individual is organizing incoming information inefficiently, it may be that they are comprehending and recalling that information on the basis of stimulus saliency rather than the relative importance of the stimulus units. Spitz (1966) has constructed a model in which input organization is included in a more general learning paradigm. This model begins with the arousal of the organism, moves through organizational processes, and concludes with the retrieval of material from a permanent memory file. According to Spitz, individuals may lose information anywhere along the line. If the retarded individual is organizing information along ways not facilitative to future recall of important material (i.e. along a path of stimulus saliency instead of importance), the important information may not be available at the time it is needed for retrieval.

There is evidence to support Spitz's assertion of organizational deficits in retardate learning and memory. MacMillan (1970, 1972), for example, investigated the effects of experimenter imposed grouping of stimuli on retarded learning. Digits were presented to retarded

children in either grouped or random form, and the children were required to recall the numbers after various retention intervals. MacMillan found a trend suggesting that retardates improved in their learning and recall as input organization increased. Conversely, the nonretarded control group actually learned best under conditions of lesser amounts of experimental imposed stimulus organization. MacMillan concluded from this that the retarded subjects possessed a strategic deficit in that they either did not know the appropriate organizational strategy or else did not spontaneously use such a strategy in organizing incoming stimuli.

Gerjouy and Spitz (1966) also demonstrated an organizational deficit in the mentally retarded. Gerjouy and Spitz presented 20 words from four categories to retarded and nonretarded individuals. These words were presented either in blocked format (PC) or else randomly (RC). Gerjouy and Spitz reported that clustering in recall developed and increased over trials as a function of the mental age of the subject, and that both the PC groups recalled significantly more than the RC groups. As interpreted by the experimenters, their retarded learners were deficient in the ability to spontaneously organize incoming material but did possess the ability to take advantage of external organization when it was explicitly provided for them. The authors concluded that the evidence supported Spitz's (1966, 1973) hypothesis since the external organization of stimulus material facilitated retardate learning. Additional support for the Spitz hypothesis has been reported by Evans and Beedle (1970), Harris (1972), and Sitko (1970).

Another variable assumed to be related to retardate difficulties in learning and recall is the inability to selectively attend to relevant but nonsalient dimensions. This process is similar to structural importance in that the process of selective attention requires the individual to attend and respond to a particular stimulus rather than to other irrelevant stimuli in the perceptual field. However, according to Hagen and Kail (1975), selective attention is more than sensory awareness. Rather, it is a cognitive process which includes strategic features of information processing. Thus, selective attention encompasses control processes and strategies such as an emphasis on the structural importance of the units to be learned.

Zeaman and House (1963) and Fisher and Zeaman (1973) have postulated a theory of selective attention which is similar to the structural importance hypothesis in that it states that for an individual to be successful at a learning task, the learner must pay attention to the important aspects of the task while paying less attention to the unimportant task dimensions. Fisher and Zeaman (1973) have hypothesized that "paying attention" requires the processing of relevant stimuli while simultaneously being confronted with irrelevant stimuli. Thus, according to Zeaman and House, (1963), in order to be successful at a cognitive task, the individual must 1) maintain a high level of arousal to attend, 2) scan the stimulus field and attend to relevant stimuli, 3) shift attention quickly to changing relevant stimuli, and 4) maintain attending behavior over extended spans of time.

Zeaman and House (1963) and Crosby and Blatt (1968) have attributed the learning problems of the retarded to the inability of retarded

individuals to adequately sample the stimulus field and to select relevant stimuli for processing and later retrieval. Thus, according to Crosby and Blatt, memory failures in the retarded occur not because of retrieval failures in long-term memory but because irrelevant information was placed into long-term memory in the first place.

Zeaman and House (1963) have suggested that learning differences in retarded children result not from deficiencies in the structural processes which control attention but rather in deficiencies in instrumental conditioning. The authors argue that because retarded learners experience difficulties understanding cause and effect environmental contingencies, they display a low probability of attending to the correct stimulus dimensions of a task. Moreover, Zeaman and House (1963) and Fisher and Zeaman (1973) view selective attention as a control process which may be trainable and correctable. Thus, according to Zeaman and House (1963) and Fisher and Zeaman (1973), retardate attention problems perhaps may be modified with stimulus manipulation and reward outcomes. If this is indeed the case, then the training and correction of these attentional difficulties is a subject germane to educational inquiry.

There is evidence to support the position that the retarded learner's difficulties are due in part to problems of selective attention, and that these problems sometimes can be corrected. For example, Evans (1968) conducted a series of experiments designed to assess the influence of stimulus factors on the learning of retarded adolescents. Stimulus variables in the experiments included the salience of irrelevant stimulus dimensions and the number of irrelevant dimensions. Evans found in three separate experiments that the

intelligence level of the subject was significantly and negatively related to the probability of making mistakes in learning along irrelevant stimulus dimensions. This relationship held both for degree of saliency of the irrelevant dimensions as well as for the number of irrelevant dimensions. Evans (1968) concluded that the saliency and quantity of the irrelevant dimensions was significantly related to the efficiency of retardate learning.

In a later experiment, Clinton and Evans (1972) investigated the effects of irrelevant stimulus dimensions and/or complexity, mental age, and reward or nonreward on retardate learning. A 3 x 2 x 2 factorial design was utilized with levels of irrelevant dimensions, mental age, and initial reinforcement or nonreinforcement for appropriate responses being the three factors in the design. Clinton and Evans found a significant main effect for both complexity and the complexity x reinforcement interaction. Post hoc analysis revealed that while there were no differences between groups in the reinforcement conditions at the high and low levels of stimulus complexity, there were significantly more errors at the intermediate levels of complexity. In the nonreinforcement condition, the effects of stimulus complexity were successfully ordered from low level (one irrelevant stimulus dimension) to high level (three irrelevant stimulus dimensions) of complexity. Clinton and Evans interpreted these results as supporting the Zeaman and House (1963) hypothesis since task difficulty and probability of task success by the retarded learners were a function of the number of irrelevant stimulus dimensions.

Clinton (1972) investigated the effects of between-trials variability, reward vs. nonreward, and mental age on discrimination

learning of retarded individuals. Mentally retarded children were assigned to one of twelve cells in a 3 (trials) x 2 (reward or nonreward) x 2 (MA) design. Clinton (1972) reported a significant main effect for reward vs. nonreward when the learner's task included irrelevant stimulus dimensions. Neither of the other main effects or interactions were significant. Clinton (1972) interpreted the data from this study as being consistent with the Zeaman and House (1963) hypothesis. Furthermore, Clinton interpreted the results as showing that higher reinforcement ratios for attending to relevant stimulus dimensions could reduce response errors. Clinton suggested that retarded learners perhaps could be trained to disregard salient but irrelevant stimulus dimensions in favor of gaining a reward for attending to more relevant dimensions.

Ullman and Routh (1971) conducted a study to test the effects of having several relevant dimensions on the learning of retarded individuals. Ullman and Routh hypothesized that increasing the proportion of relevant to irrelevant stimulus dimensions would weaken the effect of the irrelevant dimensions and lessen the learning problems of the retarded subjects. Retarded and nonretarded children were presented with a two choice discrimination problem in which both stimuli consisted of one, two, four, or eight relevant stimulus dimensions. The position of the stimulus was always varied and the position of the stimulus was always a task irrelevant dimension. The task was to select the correct stimulus object. Results were analyzed using a 2 (IQ level) x 4 (number of irrelevant dimensions) x 12 (trials) design. The main effect of IQ was significant but the nonsignificance of the interaction between IQ level and number of relevant dimensions

was contrary to expectations. The data indicated that increasing the relevant dimensions improved the performance of both IQ groups. Ullman and Routh (1971) interpreted their results as partially supporting Zeaman and House's (1963) position since the differences between the IQ groups in the rate of learning did not increase across trials. According to Ullman and Routh, the retarded individuals performed poorly because they required more time to discriminate than did the normal subjects. The finding that increases in the number of relevant dimensions facilitated discrimination learning was interpreted by Ullman and Routh as being supportive of the Zeaman and House hypothesis.

Klein, Klein and Patnode (1972) investigated the influence of color distractors on a discrimination task. In keeping with the Zeaman and House (1963) hypothesis, Klein et al. predicted that retarded children would attend to more salient but irrelevant dimensions than nonretarded children. Figures were presented to the children on white cards; each card consisting of four ink drawings. On some of the trials, one of the identical figures was drawn in red ink, the other three in black. The experimental task was for the subject to tell which figure on the card was different. The results showed that the retarded children made significantly more errors than the nonretarded children. Additionally, the retarded children made significantly more errors on the color distractor cards than on the nondistractor cards (all black ink drawings). The color distractors, however, did not have a significant effect on the performance of the nonretarded group. The authors hypothesized that ink color was a highly salient cue for the retarded children but not for the nonretarded children, and they interpreted these findings as supporting the Zeaman and House (1963) hypothesis.

Research regarding the learning and recall of normal children under the age of five or six indicates that retarded individuals are not the only learners who show nonadaptive task attention to irrelevant but salient stimulus dimensions. For example, Sabo and Hagen (1973) investigated selective attention in children of ages 8, 10, and 12. During a ten-second delay period which occurred between the last stimulus presentation and the test, half of the children were told to "think about the pictures" which they had just been shown. The other children were instructed to count aloud during the delay. Sabo and Hagen found that the difference in recalling central vs. irrelevant stimuli increased with age. Allowing the learners to rehearse had a significant positive effect on performance at age 12, a more moderate effect at age 10, and no effect at age 8. Sabo and Hagen concluded that during the unfilled retention interval, older children made use of the rehearsal process which allowed selective attention to task-relevant information. Thus, identification of relevant stimuli was followed by cumulative rehearsal which subsequently allowed the child to rehearse stimulus items when they were absent.

Hagen and Frisch (1968) investigated differences in learning performances when central and irrelevant pictures were paired. In one condition, randomly chosen incidental pictures always appeared with the same central picture. In a second condition, the pairing was randomized on every trial. In the third condition, the same irrelevant picture was paired with each central picture on a given trial. Hagen and Frisch reported that the ability to selectively attend to central pictures increased with age. Hagen and Frisch reasoned that if the younger child's inability to selectively attend was due to a perceptual

deficit, then one would expect that when the irrelevant pictures were not always paired with the central picture, improved learning and recall performance should have occurred. However, the results ran counter to predictions from a perceptual deficit hypothesis and were consistent with the Zeaman and House (1963) hypothesis.

Hale, Miller, and Stevenson (1968) investigated selective attention processes in normal 13-year old children in a naturalistic rather than in a laboratory setting. After viewing a film presentation, the children were asked questions about the film which pertained either to central features of the film as related to the story line or were asked about occurrences in the film which were incidental to the story line. Hale et al. found that recall of incidental units increased with age up to 12 years at which point recall of incidental ideas began to drop. Hale et al. interpreted these results to be consistent with a selective attention hypothesis.

Finally, Brown (1977) demonstrated that 8- and 10-year-old children experienced difficulty in identifying units that were structurally important while 11- and 18-year-old students had little difficulty on such a rating task. Brown hypothesized that the younger children were influenced and distracted by the high saliency of certain subunits which were interesting but not important. Significantly, however, the recall patterns of the younger children were related to the variable of structural importance even though the children had difficulty in judging the importance of the respective subunits.

Taken together, these studies seem to indicate developmental and mental age differences in the ability to attend to and encode central items while resisting the tendency to focus on incidental items having

high saliency. Likewise, since attention can be influenced by selectively rewarding memory for important material (Fisher & Zeaman, 1973), it is possible that organizational deficits are remediable.

Metacognition and Its Relationship to Learning Performance

Metacognition refers to the individual's knowledge and awareness of his cognitive abilities (Flavell, 1971; Flavell & Wellman, 1977). Included in the category of metacognition is metamemory. As defined by Flavell and Wellman (1977), metamemory is the "individual's knowledge of and awareness of memory or of anything pertinent to information storage and retrieval." Metamemory thus involves the choice and subsequent use of differential learning strategies in order to facilitate memory performance.

There is evidence to suggest that metacognition is developmental in nature and that these developmental progressions are directly linked to improvements in memory (Hagen & Stanovich, 1977). For example, metacognitive mechanisms have been considered to be related to verbal mediational processes (Flavell, Beach, & Chinsky, 1966; Keeney, Cannizzo, & Flavell, 1967), serial rehearsal (Hagen & Kingsley, 1968; Hagen & Kail, 1973; Kingsley & Hagen, 1969), and study time required in learning (Flavell, Friedrichs, & Hoyt, 1970; Masur, McIntyre, & Flavell, 1973; Ornstein, Naus, & Liberty, 1975). According to Hagen and Stanovich (1975), developmental improvements in memory cannot be attributed to an enlarged structural capacity. Rather, it appears that these improvements occur, at least in part, because of an increased ability to use task-appropriate strategies to facilitate memory as the

child grows older. Thus, it appears that as children grow older, they become increasingly more strategic and planful in confronting memory tasks (Flavell & Wellman, 1977). These general strategies are hypothesized to combine with more specific strategies in the child's response repertoire for coping with the cognitive problems that are encountered (Hagen & Stanovich, 1977).

Studies concerning the metacognitive strategies of retarded learners with prose materials have been virtually nonexistent. However, a number of investigations have focused on metacognitive processes of retardates in the learning of nonprose materials. For example, Ellis (1970) examined the effects of a metacognitive rehearsal strategy on retardate serial learning performance. An absence of a primacy effect in the retarded subjects was reported, thus indicating deficiencies in long-term memory. Ellis interpreted the lack of a primacy effect as reflecting an absence of a cumulative rehearsal strategy which inhibited transfer of material from short-term to long-term memory. Thus, the retarded subjects in this study did not successfully utilize a metacognitive rehearsal strategy in order to facilitate the remembering of the list.

Similar findings were reported by Belmont and Butterfield (1969, 1971, 1977). Belmont and Butterfield (1971), for example, focused on strategies of acquisition in a self paced presentation of stimuli. The nonretarded learners typically engage in a pattern of responding termed "cumulative rehearsal, fast finish" (Belmont & Butterfield, 1971). In this pattern, an initial phase of brief pauses between presentations of stimuli is followed by a single long pause which in turn is followed by a final series of short pauses. For mature learners, increasing the

list length served to increase the number of long pauses the subject took between presentations of stimuli. Belmont and Butterfield interpreted this pattern to mean that nonretarded learners used the long pauses to rehearse the responses and commit them to long-term memory. In contrast, the retarded learners did not change their self presentation rates when the list was lengthened. Belmont and Butterfield interpreted these results to mean that the mentally retarded learners were not using long pauses to engage in an effective rehearsal strategy.

Brown (1974) devised two memory tasks which differed in the extent to which metacognitive skill was necessary for task success. In the first task, subjects engaged in a picture recognition task which presumably did not require metacognitive ability. Brown's second task involved remembering the last instance of an item in one of several different categories. Efficient performance on this task presumably did require metacognitive competency. Brown hypothesized that retarded and nonretarded individuals would perform significantly different only on tasks requiring sophisticated metacognitive skills. Consistent with the hypothesis, Brown found that the performance of retarded and nonretarded individuals differed only on the second task. Thus, according to Brown, the retarded subjects on the second task displayed a metacognitive deficiency.

Similar to Brown (1974), Brown, Campione, Bray, and Wilcox (1973) also examined the possiblity that failure to rehearse selectively contributed to poor retardate performance in a keeping-track task. When retarded adolescents were trained to rehearse the last instance of each category, their performance approximated that of the nonretarded subjects and was not dependent on the number of instances per category.

Thus, Brown et al. (1973) demonstrated that this particular metacognitive strategy was trainable in retarded adolescents and that such training closed the gap between retardate and nonretardate performance.

In a separate but related experiment, Brown et al. (1973) provided additional evidence to support the hypothesis that metacognitive abilities influence learning performance. Brown et al. attempted to disrupt the use of a selection strategy in nonretarded individuals by requiring subjects to repeat each item as it occurred rather than using a strategy of repeating the last word of each category presentation. Recall under this condition was significantly lower than recall by subjects who did not have their strategy disrupted, and the performance of these adolescents was similar to the retarded subjects. These results, according to Brown et al., pointed strongly to a rehearsal deficit in retarded individuals.

Other experimenters have endeavored to demonstrate metacognitive deficiencies in retarded learners by showing that improvement in performance occurs after training. The logic behind these studies has been that if performance can be improved by such training, then a central process which is strategic in nature is implied rather than an invariant structural component (Campione & Brown, 1977).

Perhaps the most ambitious study in this vein was a strategic training study conducted by Butterfield, Wambold, & Belmont (1973). This study involved a highly detailed analysis of the strategic requirements involved in succeeding at a short-term memory task. More specifically, Butterfield et al. attempted to teach a specific retrieval plan. Subjects were exposed to an array of six items in a self-paced task. The retrieval strategy involved the teaching of students to

pause after the third item in a list and actively rehearse the three initial items. Following this, the subject was taught to expose the last three items passively and call for a recall probe immediately. The logic of this acquisition strategy was that if the time period was short enough, the last three items would still be in short-term memory so that no active maintenance rehearsal would be required to regenerate the memory trace in short-term memory (Craik & Lockhart, 1972). Once subjects acquired the appropriate strategy through training, efficient performance on the task required that the subject respond to the probe item by first searching through the last three items before they faded from short-term memory. If, however, the subject explored the initial three items first and the target item was not located there, the last three items would have already faded from short-term memory and recall performance would be poor. Thus, a good metacognitive strategy would be to search for the last three items in memory and search for the first three items only if the target item were not initially located. If the initial three items were searched for first, the strategy would be violated.

The data from the Butterfield et al. (1973) study indicated that the retarded subjects did not spontaneously use this strategy. They also reported that for these individuals, subsequent recall was poor. However, after a concentrated training period, performance improved with the degree of improvement being related to the extent to which the actual sequencing of the retrieval strategy was trained and learned. The results of Butterfield et al. thus strongly suggested that rehearsal training led to strong performance improvements. In fact, by the end of the experiment, retarded subjects were performing at the

same level as untrained college studerts.

Regarding the use of metacognitive and metamemory strategies in the learning and recall of the mentally retarded, Campione and Brown (1977) conclude that although moderately retarded children show a deficiency in their use of memory strategies, these strategies are of the production type and are thus remediable. However, it should be kept in mind that almost all of the experiments which have investigated the metacognitive porcesses of the retarded have used unrelated stimuli rather than connected discourse or prose. Although differences in metacognitive functioning in the areas of selective attention and structural importance have been demonstrated with young, normal children (Brown & Smiley, 1977; Danner, 1976; Otto, Barrett, & Keenke, 1969), little or no work has been conducted investigating the use of these strategies by retarded learners. In short, it is not known whether mentally retarded students can attend selectively to differing levels of importance in prose. Additionally, if such strategies are not demonstrated, it still does not indicate whether or not the child has the strategy in his repetoire but is not spontaneously using it (Flavell, 1977). Only training and practice in such strategies, and an assessment of the effects of such strategies on subsequent performance can provide answers to these questions.

Statement of Problem and Hypotheses

This study addressed itself to the problem of what is comprehended and remembered during the presentation of discourse to mentally retarded pupils. More specifically, it asked whether impairment of memory performance in these individuals occurred because of basic failures in

their ability to glean useful and important information from prose or from an inability to spontanously use strategies which would facilitate the remembering of comprehended material.

Another purpose of the study was to investigate the influence of textual structural importance on the memory performances of the mentally retarded. The comprehension of an author's main ideas has been shown to be of critical importance in the comprehension and recall of prose by nonretarded individuals. However, investigations of the effects of structural importance on the learning and recall of the mentally retarded have been virtually nonexistent. The ability to identify and attend to structurally important units was hypothesized to be related to memory performance in the retarded. Thus, an inability to accurately differentiate important from nonimportant idea units was postulated to be an important determinant of poor recall performance.

A third objective of this study was to investigate whether mentally retarded students would use the differing importance levels in text as an aid in recall once they were made aware that such a strategy might be useful as a mnemonic device. Mentally retarded students and a normal control group were presented with passages containing units judged by college students to be important as well as units judged to be high in stimulus saliency but low in structural importance. The mentally retarded students rated the idea units for structural importance using a modification of the Johnson (1970) technique. Finally, the students attempted to recall the story in its entirety.

Prior to receiving the passage, different groups received instruction that varied in the extent to which there was stress on making accurate importance ratings so as to facilitate passage recall. Brown (1974)

has demonstrated that learners are able to differentially utilize cognitive strategies in facilitating learning when they are made aware of the utility in using the strategy. The task instructions in the present study thus were hypothesized to lead to differential sensitivity on the part of the retarded individuals to the usefulness of using importance judgments to aid recall. One group was instructed initially regarding the usefulness of accurate judgments of structural importance, but the group was not repeatedly reminded to make such judgments. Another group was frequently reminded of the facilitative effects of making accurate importance judgments on recall. It was anticipated that the retarded subjects would not spontaneously attempt to differentially remember the important units. The group which frequently received reminders, however, was expected to show increased recall. In the context of Flavell's (1971) theorizing, the retarded individuals thus were expected to demonstrate a production deficit rather than a mediational deficit in using importance levels to facilitate recall.

In summary, the following hypotheses were tested:

1. The process of rating structural importance in a story was expected to facilitate subsequent recall. Thus, it was believed that groups of mentally retarded pupils who participated in such a rating process would show a significant increase in the amount remembered as compared to a control group that did not engage in the rating task.

2. It was postualted that mentally retarded students would judge the importance of the idea units of a story differently than that of a group of college raters. Mentally retarded individuals were expected to show less sensitivity and accuracy with respect to what ideas were important and unimportant.

3. Knowledge of an upcoming recall task was expected to lead to more accurate rating judgments and improved recall. Thus, groups of mentally retarded students who were informed of upcoming recall demands were expected to show increased overall recall of the story as well as improved memory for important idea units.

4. The development of a strategy of identifying and using importance levels to aid in recall was expected to lead to more accurate judgments and recall by the mentally retarded students. It was also hypothesized that students who received frequent admonishments to use textual importance to aid in their recall would demonstrate greater recall than a group that received these instructions only once. Thus, the mentally retarded pupils were expected to demonstrate a production deficit in using differing importance levels to aid in their remembering efforts.

Chapter III

METHODOLOGY

Subjects

Subjects in the study were 80 mildly retarded individuals and 16 normal children. The chronological ages of the retarded students ranged from 10.0 years to 17.0 years with a mean age of 13.18 years (SD = 2.81). Table 1 shows the number of retarded students included at each chronological age. IQ's of the retarded pupils were obtained by intelligence test results found in student's cumulative folders. The intelligence test used was either the 1960 revision of the Stanford-Binet or the Wechsler Intelligence Test for Children. The intelligence test was administered by a certified school psychologist no more than four years prior to the date that the student participated in the experiment. Student IQ's ranged from 50-73 with a mean of 63.7 (SD = 9.15).

The 16 nonretarded children who served as a control group were selected from second, third, and fourth-grade classrooms at the Campus School, State University of New York College of Arts and Sciences at Geneseo. Students were selected on the basis of their scoring within plus or minus one standard deviation from the mean on the Otis Lennon Mental Abilities Test - Elementary Form. All of the nonretarded

students were reading between the 45th percentile to the 50th percentile on the Stanford Achievement Test.

Table 1

Mentally Retarded Students by Chronological Age

Chronological Age	Number of Students
10	1
11	5
12	21
13	30
14	17
15	4
16	1
17	1
	N=80

Cumulative record folders indicated no evidence of neurological handicaps, defects in hearing, or uncorrected visual defects for any of the subjects included in the study. All participants resided in a home or foster home with a parent or guardian and attended school on a full-time basis. All of the mentally retarded students included in the study were attending school in self-contained classrooms for the mentally retarded in school districts covering an 80 mile radius around Geneseo, New York. School districts included in the study were recruited from a list of districts which accepted State University of New York at Geneseo undergraduates as student teachers. Appendix A contains a copy of the recruitment letter sent to school districts

while Appendix B contains a sample parent consent form. Mentally retarded subjects who participated in the study received an honorarium of $2.00. The campus school declined the honorarium for the nonretarded children.

An additional 96 college undergraduates provided normative ratings of pausal acceptability, structural importance, and stimulus saliency. Pausal acceptability was operationally defined as a place in a story where a reader might "catch a breath, give emphasis to a story, or enhance meaning" (Johnson, 1970). Structural importance referred to the perception by readers that some ideas, phrases, or sentences in text were more important, central to theme, or superordinate than others. Saliency was operationally defined as the attention getting or interest potential of ideas, phrases, or sentences in the text. The undergraduate raters were freshmen or sophomores majoring in education at State University of Arts and Sciences at Geneseo and were enrolled in an introductory special education course.

Materials

The 289-word passage used in the experiment was a fictional story entitled "The Bank Robbery." As judged by eight certified teachers of the mildly mentally retarded, the story was written at an appropriate reading and interest level for adolescent, mildly retarded students. Additionally, a pilot study conducted with 21 mildly retarded students at intermediate, junior high, and high school EMR levels indicated that the vocabulary included in the story was likely to be in the functional vocabulary of students. A copy of the story may be found in Appendix C.

Thirty-four college students were presented with a copy of "The Bank Robbery" and were asked to make ratings of pausal acceptability. Raters were asked to indicate where a pause in a given phrase would be appropriate in order to "catch a breath, give emphasis to a story, or enhance meaning (Johnson, 1970)." The boundary of a unit was assumed when at least 66% of the raters indicated a given location would be an acceptable place for a pause. Fifty-seven pausal units were identified in "The Bank Robbery." A copy of instructions given to raters of pausal acceptability may be found in Appendix D.

Additionally, 32 college raters judged the 57 idea units for structural importance and a separate group of 32 raters judged the story for stimulus saliency. Raters of structural importance were told that some ideas in the story were more important than others and that certain ideas, sentences, or phrases could be eliminated without serious damage to the structure of the passage (Johnson, 1970). Raters were asked to judge each idea unit of the story on a scale from 1 to 7 with "1" being least important and "7" being most important. Likewise, a separate group of raters were asked to judge the stimulus saliency or attention-getting potential of the idea units on a similar scale of 1 to 7. Mean importance and saliency scores for each of the 57 idea units were obtained, and the units were separately rank-ordered for importance and saliency. Appendices E and F show instructions given to raters of structural importance and stimulus saliency.

Procedures

Mentally retarded students were assigned to one of five groups; the nonretarded pupils all were assigned to a control group. Assignment

of individuals to a particular group was random in regard to age, sex, and IQ. Table 2 contains the mean IQ scores for the five groups of mentally retarded pupils and the group of nonretarded students.

Table 2

Mean IQ's of the Experimental Groups

Group	N	$\bar{x}$ IQ
I (Non-retarded - Control)	16	104.6
II (Retarded - Control)	16	63.4
III (Retarded)	16	63.9
IV (Retarded)	16	64.5
V (Retarded)	16	64.0
VI (Retarded)	16	63.0
	96	63.76

The 96 participants in the six groups each were tested individually. All students were informed that they would be hearing a story. A printed copy of the story was made available to the Ss and they were encouraged to read the story as it was presented auditorily. The students were told that if they experienced difficulty in reading and listening, they could simply listen. Auditory presentation was slow enough to allow students to read the text and listen to the story but not so slow as to destroy the meaning of the phrase units. The decisions to present the story both auditorily and graphically, as well as to allow subjects to follow along in both modality presentations or in the modality presentation of choice, were based on findings by James (1962), Sticht (1969), and Sticht, Caylor, Kern, and Fox (1971). In

these studies, it was found that poor readers preferred to have material presented auditorily but that a preference for learning in a given modality did not necessarily lead to a significant increase in learning by use of that modality. Thus, the decision was made to allow Ss to choose a modality presentation or to use a combination of modalities. All students were tested individually and while the story was being auditorily presented, the experimenter sat next to the child and pointed to the graphic representations of the spoken words. This was done in order to facilitate reading comprehension.

Prior to hearing and reading "The Bank Robbery," all students listened to and read a practice story titled "The Fireman's Friend." This story was similar in length and vocabulary to "The Bank Robbery." As rated by 32 independent college raters, "Fireman's Friend" contained 62 idea units. Students in four of the six groups received training on making ratings of structural importance, made ratings of structural importance on "Fireman's Friend," and received feedback as to the adequacy of their ratings. Students in the two control groups listened to and read the story but received no training in making ratings of structural importance and made no subsequent ratings. A copy of "Fireman's Friend" is contained in Appendix G while Appendices H to J contain instructions to subjects regarding "Fireman's Friend."

After exposure to "Fireman's Friend," all subjects heard and read "The Bank Robbery." Following presentation of the story, students in the rating conditions received a second presentation of the story in which the idea units were presented one unit at a time. For both "Fireman's Friend" and "The Bank Robbery," students who made ratings of structural importance used a three point scale with "1" being "not

important," and "2" being "a little important," and "3" being "very important." The three-point scale was utilized after pilot study data demonstrated that retarded students did not adequately handle the relative complexity and abstractness of a seven-point scale. To aid the student in making ratings, students received a piece of paper with a long, horizontal line drawn in the middle. The line was divided by three short vertical lines with the vertical line on the far left labeled "1" or "not important," the middle line as "2" or "a little important," and the third line labeled as "3" or "very important." As the subject pointed to the mark on the line which corresponded to his rating, he/she was also instructed to say his rating for the idea unit. If the subject pointed to a rating but stated a rating which did not correspond to the pointed unit, the experimenter pointed to and read each of the rating possibilities and asked the student to rate the unit again. If the subject pointed to a rating but said nothing, the experimenter asked the student to say his/her rating. This procedure was followed until the subject rated all 57 units. Appendix K contains the rating instrument used by raters of the idea units.

The two control groups did not make ratings of structural importance. In order to equalize number of presentations between groups which did and did not make ratings of structural importance, subjects in the nonrating groups heard and read the story a second time and responded to each idea unit by stating a letter of the alphabet. This nonsemantic task was chosen on the basis of observations by Christie and Schumacher (1975) that using a semantic irrelevant task might interfere with strategies used by the subject as they attempted to recall the story. This observation was confirmed during the pilot

study when retarded subject's response protocols included items from the semantic, interpolated task. Based on these observations, the decision was made to use a nonsemantic task similar to the letter cancellation task utilized by Christie and Schumacher (1975).

After rating "The Bank Robbery" for structural importance or responding to the idea units with the letter task, all subjects heard and read the story once more. Immediately after this presentation, the students were instructed to orally recall the story into a tape recorder. However, the pilot data revealed a general inability of retarded individuals to appropriately recall the story without an initial cue. Recall protocols of noncued retarded subjects took the general forms of adding to the story or making up a new one, or not being able to recall any of the story. Furthermore, the inability to recall the story appropriately was a function of IQ level. The experimenter faced the alternatives of 1) excluding Ss with low IQ's who claimed that they did not remember any of the story, 2) differentially cuing subjects who claimed that they could not remember the story, 3) cuing everyone with the same initial cue. Based on both the data of the pilot study and the special learning characterisitics of the subjects in this study, the decision was made to cue all subjects with "one day." This allowed all subjects to remain in the study, allowed for a non-restricted range of IQ's, and significantly increased the recall protocols of subjects by starting them off in appropriately recalling the story. Although one idea unit thereby was lost from the analysis, the decision was made to use an initial cue so as to optimize recall and maximize the inclusion of subjects in the experiment. Students in the nonretarded control group also were cued with the unit "one day" so as to equalize

treatment in the control conditions. Apendices L to R contain the structural importance, letter naming, and recall instructions.

Design

A total of six groups were tested with the treatment conditions differing as a function of 1) whether students were given advance notice of later recall requirements, 2) whether importance ratings were required, and 3) the extent to which there was emphasis on the potential usefulness of structural importance in aiding recall. Group 1 was a comparison group of subjects with normal intelligence. This group recalled the story after the two presentations, but they were not forewarned regarding later recall and they did not perform the rating task. Group 2 consisted of mentally retarded learners and were treated identically to Group 1. Group 3 received neither advance instructions regarding future recall nor information as to the usefulness of using a structural importance strategy in recall. However, Group 3 did make ratings of structural importance prior to recalling the story. Group 4 received warning that part of the experimental task involved recalling the story, and this group also made ratings of structural importance. However, Group 4 received no information as to the usefulness of using a structural importance strategy in attempting to recall the story. Group 5 received warning that recall would be expected and they received information regarding the usefulness of using a structural importance strategy in recall. However, Group 5 received information as to the usefulness of this strategy only once, at the beginning of the rating task. Group 6 was informed that part of the experimental task involved recalling the story. In addition, Group 6 was informed of the potential

usefulness of a structural importance strategy in recall and received constant reminders throughout the task to utilize an effective structural importance strategy to aid in recall. A summary of treatment variations may be seen in Table 3.

Table 3

Experimental Design

Groups	Expectation of Recall	Performance of Rating Task	Emphasis Regarding Usefulness of Rating Task for Later Recall	Recall
I Normal (Control)	No	No	Not Applicable	Yes
II Retarded (Control)	No	No	Not Applicable	Yes
III Retarded (Ratings)	No	Yes	None	Yes
IV Retarded (Expectation)	Yes	Yes	None	Yes
V Retarded (Low Emphasis)	Yes	Yes	Low	Yes
VI Retarded (High Empahsis)	Yes	Yes	High	Yes

Statistical analyses were conducted using analysis of variance tests. The critical level of significance for all statistical tests was $p < .05$.

CHAPTER IV

RESULTS

Ratings of Idea Units

Ratings of the structural importance of the 57 units of "The Bank Robbery" were made by 32 college judges. The mean rating of each idea unit by the college judges was then used in a rank ordering of the units, and the units then were divided into three categories of low, medium, and high importance units based on ratings by the college judges. The three importance levels each contained 19 idea units. In an assessment of the reliability of the ratings of structural importance, the group of 32 raters was randomly split into two groups of 16. A comparison of the orderings of importance of the 57 units for the two groups showed a Pearson r of .69. Appendix S contains the rank ordering of the idea units by structural importance, as well as the idea units contained in each of the three structural importance levels.

The 57 idea units were also rank ordered for stimulus saliency as judged by another group of 32 college raters. The units were divided into three categories of low saliency, medium saliency, and high saliency. Nineteen units were contained in each saliency level. Following the same procedure used in assessing the reliability of the importance ratings, the raters of saliency were randomly split into

two groups. Comparison of the relative rankings of the two groups across the 57 units showed a Pearson correlation of .93. Appendix T contains the rank ordering of the idea units along the dimension of stimulus saliency as well as the idea units contained in each saliency level.

The first unit of the story "One day," which was utilized as a cue for recall for all of the experimental subjects, was eliminated from further analysis. This unit was one of the 19 units in the low importance category. To equalize the number of idea units in the other two importance categories, the unit "said the man" was eliminated from the medium importance category and the unit "stop" was eliminated from the high importance category. These units were eliminated on the basis of their having the same serial position in the rank ordering of the units of medium importance and high importance as the unit "One day" had in the ordering of the low importance units. The three eliminated units appeared in the story as 1, 21, and 39 respectively. The Pearson correlation coefficient between the importance ratings assigned by the college judges and the importance ratings assigned by the mentally retarded students was $\underline{r} = .66$ across the 54 idea units.

Guessing scores were calculated for each learner's ratings of structural importance. A guessing score was defined as the number of times a learner rated units as belonging to a given importance category divided by the number of idea units in the story (54). The guessing scores reflected the differential tendency of learners to rate idea units as belonging to a particular structural importance category. For example, if a learner rated 20 units as being unimportant, 10 units as being of medium importance, and 27 units as being very important,

that learner's guessing score for each importance category would be .370 (20/54), .184 (10/54), and .500 (27/54), respectively. A differential use of the three ratings categories was evident in a one-way repeated measures analysis of variance of the guessing scores of the 64 retarded students who made structural importance ratings. The analysis revealed a significant difference between guessing scores at the three importance levels, F (2,126) = 50.64, $p < .001$. A Newman-Keuls analysis revealed the high importance category was chosen by learners significantly more often than either the medium or low importance categories, and that the low importance category was chosen significantly more than the category of medium importance ($p < .05$). Table 4 shows the means and standard deviations of the three guess scores while Table 5 contains the analysis of variance summary table.

Table 4

Means and Standard Deviations of Guessing Scores of Mentally Retarded Raters

Score Type	Mean	Standard Deviation
Low Importance Guess	.286	.138
Medium Importance Guess	.183	.110
High Importance Guess	.478	.159

Accuracy scores were defined as the number of times a learner placed an idea unit in the same importance category as the college raters divided by the number of times the subject chose a given importance level category when the 54 idea units were rated. Accuracy

scores reflected the sensitivity of the retarded raters in the appropriate placement of each idea unit into the various importance levels after correction of response biases in the usage of the various importance categories. For example, if a learner rated 30 idea units as being of low importance but only 15 of those choices agreed with the structural importance ratings of the college judges, the learner's accuracy score for low importance units would be .500 (15/30). Accuracy scores were predicated on the assumption that the ratings of the idea units by the college raters represented an accurate appraisal of the true relative structural importance levels of the units since these judges represented mature and successful comprehenders.

Table 5

Analysis of Variance Summary Table

of Guessing Scores of Mentally Retarded Raters

Source	df	Sum of Squares	Mean Square	F	p
Mean	1	19.1363	19.14	11870933.32	.001
Error	126	.0001	0.00		
Guess Score	2	2.8757	1.44	50.64	.001

Since the accuracy scores and guess scores for each subject who made ratings were expressed as proportions, an arcsin transformation was performed on the data. This transformation was conducted on the basis of the scores having a binomial distribution and was carried out for the purpose of stabilizing the variances (Winer, 1967). A 3 (level of structural importance) x 2 (guess vs. accuracy score) analysis of variance with repeated measures on both factors was conducted on the

ratings of the 64 mentally retarded subjects who made structural importance judgments. The results indicated a significant main effect for level of importance, F (2,126) = 50.46, p < .001, score type F (1,63) = 54.30, p < .001, and the importance level x score type interaction, F (2,126) = 25.96, p < .001. Table 6 contains the means and standard deviations for the guess and accuracy scores at each importance level while Table 7 contains the analysis of variance summary table.

Table 6

Means and Standard Deviations of Guessing and Accuracy Scores at Each Importance Level by Mentally Retarded Raters

Score Type	Mean	Standard Deviation
Low Importance - Guess	1.077	.361
Low Importance - Accuracy	1.733	.571
Medium Importance - Guess	.847	.318
Medium Importance - Accuracy	1.090	.520
High Importance - Guess	1.519	.332
High Importance - Accuracy	1.434	.249

The Newman-Keuls Studentized Range Test was conducted on the differences between treatment means. As may be seen in Table 8, the test revealed a significant difference between all groups (p < .01) except for the difference between the high importance guess scores and the high importance accuracy scores which did not reveal a significant difference

Table 7

Analysis of Variance Summary Table of Guessing and Accuracy Scores at Each Importance Level by Mentally Retarded Raters

Source	df	Sum of Square	Mean Square	F	p
Mean	1	632.63	632.63	4310.39	.001
Error	63	9.25	.15		
Score Type	1	7.07	7.07	54.30	.001
Error	63	8.21	.13		
Importance Level	2	19.39	9.70	50.46	.001
Error	126	24.21	.19		
Score Type x Importance Level	2	8.84	4.42	25.96	.001
Error	126	21.46	.17		

Difference scores were calculated between the guess and accuracy score at each importance level. This score represented the degree of accuracy above chance levels which retarded students demonstrated in identifying units of structural importance. Difference scores were calculated by subtracting each learner's guess score from his accuracy score at each importance level. A one-way analysis of variance with repeated measures was conducted on the difference scores for the 64 retarded students who made ratings of structural importance. The analysis revealed a significant difference between difference scores for the three importance levels, F (2,126) = 25.71, $p < .001$. The retarded learners were significantly more accurate in identifying

Table 8

Newman-Keuls Test of Differences

Between Guessing and Accuracy Scores at Each Importance Level

by Mentally Retarded Raters

	Medium Importance Guess (.847)	Low Importance Guess (1.077)	Medium Importance Accuracy (1.090)	High Importance Accuracy (1.434)	High Importance Guess (1.519)	Low Importance Accuracy (1.737)
Medium-Guess	-	.23+	.243+	.587*+	.672*+	.89*+
Low-Guess	-	-	.244*+	.357*+	.442*+	.660*+
Medium-Accuracy	-	-	-	.344*+	.429*+	.647*+
High-Accuracy	-	-	-	-	.085*+	.303*+
High-Guess	-	-	-	-	-	.218*+
Low-Accuracy	-	-	-	-	-	-

$\sqrt{MS/n}$ = .049

* = $p < .01$
+ = $p < .05$

units which were of low or of medium importance but were relatively inaccurate in identifying units which were high in structural importance. A Newman-Keuls analysis revealed that the retarded students were significantly worse in identifying units of high importance than units of low or medium importance ($p < .05$). Table 9 contains the analysis of variance summary table.

Table 9

Analysis of Variance Summary Table of Difference Scores at Each Importance Level by Mentally Retarded Raters

Source	df	Sum of Squares	Mean Square	F	p
Mean	1	873.18	873.18	19493.42	.001
Error	63	2.82	.04		
Difference Score	2	3.87	1.94	25.71	.001
Error	126	9.49	.08		

Recall of Idea Units

Measures of recall reflected the extent to which learners in the experimental groups remembered the idea units of the story. Recall of idea units was measured by having independent judges listen to the tape recorded protocols of each student and then judging whether or not the units had been recalled. Two judges were employed in this analysis and were instructed to use liberal scoring criteria in which an idea unit was said to have been remembered if the "main

idea, thought, or intention of the idea unit was expressed by the learner either through verbatim recall or through paraphrase." Thus, units were said to have been remembered if the gist of that unit was expressed by the pupil. Units were judged on a dichotomous scale as being remembered or not remembered. No judgments of partial recall were allowed. Where the judges disagreed on the recall of a unit, the decision of a third judge was accepted. The interrater agreement between the two judges on the total recall scores showed a Pearson correlation coefficient of $r = .982$.

A one-way analysis of variance provided comparison of the six experimental groups on the total number of idea units that were recalled. The analysis revealed significant differences in the number of idea units recalled, $F\ (5,95) = 6.35$, $p < .01$. Table 10 contains the group means and standard deviations for the six experimental groups while Table 11 contains the analysis of variance summary table.

Table 10

Means and Standard Deviations

of the Experimental Groups on Total Number

of Idea Units Recalled

Group	Mean	Standard Deviation
1 (Nonretarded)	35.44	8.02
2 (Retarded)	18.69	11.01
3 (Retarded)	25.13	9.69
4 (Retarded)	19.19	9.87
5 (Retarded)	19.50	11.71
6 (Retarded)	26.25	10.81

The Newman-Keuls Studentized Range test was performed on the difference between experimental groups. The test revealed significantly superior recall by the normal student control group when compared to the other five groups which were comprised of mentally retarded individuals, ($p < .01$). Among the various mentally retarded groups, the group which received all three treatment components (i.e., were told that part of the experimental task involved recalling the story, and were given constant reminders throughout the task that the appropriate use of textual structural importance facilitated recall, Group 6) recalled significantly more of the story than all other groups, ($p < .01$) except for the group which made ratings of structural importance only (Group 3). Group 3 recalled significantly more of the story than the mentally retarded control group (Group 2), the group which was told to expect recall (Group 4), and the low emphasis group (Group 5), ($p < .01$). Groups 2, 4, and 5 did not differ significantly from one another. Table 12 contains the differences between experimental groups and the Newman-Keuls summary table.

Table 11

Analysis of Variance Summary Table of Experimental Groups on the Total Number of Idea Units Recalled (All Experimental Groups)

Source	df	Sum of Squares		F	p
Between Groups	5	3340.34	668.07	6.35	.001
Within Groups	90	9464.56	105.16		
Total	95	12804.91			

Table 12

Newman-Keuls Test of Differences

Between Groups on Total Number of

Idea Units Recalled

Group	Group 2: Control ($\bar{X}$=18.69)	Group 4: Expectation ($\bar{X}$=19.19)	Group 5: Low Emphasis ($\bar{X}$=19.50)	Group 3: Rating ($\bar{X}$=25.13)	Group 6: High Emphasis ($\bar{X}$=26.25)	Group 1: Nonretarde Control ($\bar{X}$=35.44)
2	-	.50	.81	6.44*+	7.56*+	16.75*+
4	-	-	.31	5.94*+	7.06*+	16.25*+
5	-	-	-	5.62*+	6.75*+	15.93*+
3	-	-	-	-	1.12*+	10.31*+
6	-	-	-	-	-	9.91*+
1	-	-	-	-	-	-

* = $p < .05$ + = $p < .01$

A one-way of variance was conducted on the total number of idea units recalled by the five mentally retarded groups. The motivation for this analysis was the finding that the nonretarded control group (Group 2) was equal to or superior to all other retarded groups. When the analysis was restricted only to the retarded groups, the difference among groups were not significant, F (4,75) = 1.88, $p < .13$. Table 13 contains the analysis of variance summary table of total recall performances of the mentally retarded groups.

Table 13

Analysis of Variance Summary Table of Experimental Groups on the Total Number of Idea Units Recalled (Mentally Retarded Students Only)

Source	df	Sum of Squares	Mean Squares	F	p
Between Groups	4	842.38	210.59	1.86	.13
Within Groups	75	8500.63	113.34		
Total	79	9343.00			

A 6 (group) x 3 (level of structural importance) analysis of variance with repeated measures on the second factor was conducted in order to judge the effects of structural importance on the recall of the story. The judgments of the college raters were the basis for the three levels of structural importance in this analysis. A significant main effect was found for experimental groups, F (5,90) = 6.50, $p < .01$, and level of structural importance, F (2,180) = 112.20, $p < .001$. The interaction term was not significant. For all experimental groups.

Table 14

Means and Standard Deviations of Recall

by Importance Level by Mentally Retarded Students

(College Raters)

Group	1		2		3		4		5		6	
	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD
Low Importance	9.69	2.94	4.25	4.20	6.06	3.70	3.57	2.90	4.38	3.54	5.75	3.32
Medium Importance	13.06	3.36	7.69	4.14	10.06	3.84	8.56	3.90	8.06	4.33	11.25	4.80
High Importance	12.28	3.14	6.25	3.34	8.31	3.30	6.88	3.84	6.75	4.48	8.81	3.47

units high in structural importance and units of medium structural importance were remembered significantly better than units low in structural importance. High importance units and units of medium importance did not differ significantly in magnitude of recall. Table 14 contains the means and standard deviations of the treatment cells while Table 15 contains the analysis of variance summary table.

Table 15

Analysis of Variance Summary Table

of Recall by Importance Level

Source	df	Sum of Squares	Mean Squares	F	p
Mean	1	17860.50	17860.50	522.29	.001
Group	5	1111.17	222.23	6.50	.001
Error	90	3077.67	34.20		
Importance Level	2	851.40	425.70	112.20	.001
Importance Level (x Group)	10	36.31	3.63	.96	.48
Error	180	682.96	3.79		

A 6 (group) x 3 (level of stimulus saliency) analysis of variance with repeated measures on the second factor was conducted to ascertain the degree of recall as related to the judged saliency of the idea units. A significant main effect was found for experimental groups, F (5,90) = 6.30, p < .001, and level of saliency, F (2,180) = 22.67, p < .001. The interaction term was not significant. Overall, the effect of saliency was curvilinear with units of medium saliency being better recalled than either units of high or low stimulus saliency.

However, it should be noted that the recall patterns of some of the groups do not exhibit this curvilinear trend. Table 16 contains the means and standard deviations of the treatment cells while Table 17 contains the analysis of variance summary table.

Another analysis examined levels of recall as a function of the degrees of structural importance as judged by the retarded students themselves. That is, in this anlaysis, the importance levels of the idea units were determined by the 64 retarded pupils who made structural importance ratings of "The Bank Robbery." A 5 (mentally retarded group) x 3 (level of structural importance) analysis of variance was conducted with repeated measures on the second factor. The results indicated a significant main effect for importance level, F (2,150) = 5.04, $p < .008$. The main effect for experimental groups approached significance F (4,75) = 2.01, $p < .10$ while the interaction term was not significant, $p > .05$. Idea units of high importance were remembered better than either units of medium importance or units of low importance. Table 18 contains the means and standard deviations of the treatment cells while Table 19 contains the analysis of variance summary table.

A final analysis of the data was conducted to ascertain whether the learners who made ratings of structural importance recalled idea units differentially according to their own structural importance choices. That is, a learner's rating of each idea unit was inspected and matched with that learner's recall or nonrecall of that unit. In this analysis, the appropriateness of a learner's placing of unit ratings into importance categories was not the issue but rather whether

Table 16

Means and Standard Deviations of Recall

as a Function of Salience Level

Group	1		2		3		4		5		6	
	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD
Low Importance	12.69	3.30	6.81	4.15	9.13	3.81	7.30	3.54	7.63	5.08	9.75	4.07
Medium Importance	12.19	3.33	7.25	3.47	9.50	2.97	7.63	3.72	7.06	4.29	9.8[illegible]	4.38
High Importance	12.81	[illegible].40	6.00	4.80	8.38	4.04	6.19	4.26	6.56	4.02	8.50	3.52

the student differentially recalled those units that he himself rated as low, medium, or high in importance.

Table 17

Analysis of Variance Summary Table

of Recall by Salience Level

Mean	1	18320.17	18320.17	521.11	.001
Group	5	1108.14	221.63	6.30	.001
Error	90	3164.02	35.16		
Saliency Level	2	136.80	68.40	22.67	.001
Saliency Level (x Group)	10	18.70	1.87	.62	.80
Error	180	543.17	3.02		

A 4 (groups which made structural importance ratings) x 3 (structural importance level) analysis of variance with repeated measures on the second factor was conducted on the data. Each learner's rating of an idea unit was compared with his/her recall of that unit in order to ascertain the proportion of rated units recalled. The analysis did not reveal a significant main effect for experimental groups, F (3,60) = 1.44, p < .24, or structural imprtance level, F (2,120) = 1.80, p < .17. This indicates that rated idea units were recalled in approximately equal proportions from each importance level for the groups of mentally retarded students. Table 20 contains cell means and standard deviations while Table 21 contains the analysis of variance summary table.

Table 18

Means and Standard Deviations of Recall

by Importance Level for Mentally Retarded Students

(Mentally Retarded Raters)

Group	1		2		4		5		6	
	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD
Low Importance	6.00	4.60	8.75	3.87	5.94	3.51	6.06	4.23	8.52	3.96
Medium Importance	5.38	3.03	7.75	3.10	5.81	3.83	6.12	4.06	8.37	4.24
High Importance	6.75	3.90	8.31	3.59	7.12	3.54	7.00	3.98	9.00	3.30

Table 19

Analysis of Variance Summary Table of Recall

by Importance Level for Mentally Retarded Students

(Mentally Retarded Raters)

Source	df	Sum of Squares	Mean Squares	F	p
Mean	1	12212.27	12212.27	336.23	.001
Group	4	292.28	73.07	2.01	.10
Error	75	2724.13	36.32		
Importance Level	2	36.51	18.25	5.03	.008
Importance Level (x Group)	8	15.45	1.93	.53	.83
Error	150	543.38	3.62		

Table 20

Means and Standard Deviations of Recall by Importance Level According to the Learner's Own Structural Importance Choices

Group	3		4		5		6	
	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD
ow Importance	.411	.241	.381	.264	.351	.242	.483	.241
edium Importance	.446	.374	.323	.187	.295	.265	.456	.252
igh Importance	.456	.178	.383	.220	.397	.248	.499	.199

Table 21

Analysis of Variance Summary Table of Recall

by Importance Level According to the

Learner's Own Structural Importance Choices

Source	df	Sum of Squares	Mean Squares	F	p
Mean	1	31.92	31.92	241.39	.001
Group	3	.57	.19	1.44	.24
Error	60	7.93	.13		
Importance Level	2	.09	.05	1.80	.17
Importance Level (x Group)	6	.05	.01	.34	.92
Error	120	3.11	.03		

Chapter V

DISCUSSION

In this experiment, mentally retarded students rated the idea units of a story for structural importance and attempted to recall as much of the story as they could. The ratings of the mentally retarded individuals were compared to ratings of the same idea units by college judges in order to gauge the relative accuracy of the mentally retarded pupils in making judgments of structural importance. The analyses indicated that the mentally retarded students were able to make relatively accurate judgments of the structural importance of certain types of prose units. In particular, the retarded students showed greater accuracy in identifying units of low and medium importance than units high in importance.

The findings that the retarded individuals were able to assess the importance levels of certain types of prose units was unexpected in light of findings reported by Brown and Smiley (1977). In that study, the experimenters found that young, normal children enrolled in third grade were unable to differentiate reliably the relative structural importance of idea units in a folktale. It was therefore expected that retarded individuals with cognitive performances at the third grade also would experience difficulties in making reliable ratings of structural importance. However, while Brown and Smiley

utilized Japanese folktales as reading material, the present study used a story known to be more congruent with the life experiences and knowledge bases of the retarded students. Thus, it may have been that the retarded pupils were utilizing this knowledge in their rating choices. Further experiments might profitably utilize a variety of passages which cover the continuum of congruence with the world knowledge of retarded individuals. This would allow for a determination of the role of life experiences in the accurate identification of importance units.

It should also be pointed out that the students making the ratings in the present study were considerably older than the children utilized in the Brown and Smiley experiment. Furthermore, since the students in the Brown and Smily study were not mentally retarded, it may be invalid to compare the cognitive competencies of the two groups. As Belmont (1978) has pointed out, comparisons between retarded and non-retarded individuals have either attempted to hold chronological age constant while comparing the groups on a mental abilities dimension, or have compared groups of different chronological ages while controlling for mental age. However, it may be that this comparison of mildly retarded, secondary school students with nonretarded, elementary school pupils is invalid even though mental age was comparable. One cannot be sure that the older mentally retarded students did not bring into the experimental situation cognitive skills and strategies which had not yet been developed by the third-grade children. The existence of such skills and strategies might contribute to the differences between groups in ability to make reliable ratings of structure importance. What is needed is additional research detailing the

acquisition of cognitive skills in mentally retarded students at various chronological ages so as to ascertain the developmental onset of these skills as compared to nonretarded children.

Analysis of recall of the idea units by differing levels of stimulus saliency indicated that the groups did recall units differentially by saliency levels, but that the relationship was curvilinear and the differences in units recalled per saliency category were relatively small. That is, the mentally retarded students recalled more units of medium saliency than either units high or low in stimulus saliency. Taken with the finding that the mentally retarded students performed better in identifying units low in structural importance than units high in structural importance, it appears that the rating and recall performance of the pupils ran counter to predictions made by the stimulus saliency/selective attention hypothesis outlined by Zeaman and House (1963) and Fisher and Zeaman (1973). This hypothesis postulates that retarded learners suffer from a selective attention deficit in that they pay more attention to unimportant but interesting dimensions of the task than to the critical (but perhaps less salient task dimensions). Thus, this hypothesis would predict that the retarded raters would be relatively inaccurate at rating units low in structural importance, presumably because they attended to the salient dimensions of the unimportant units and rated them as important. The current findings, however, found that the retarded students were quite adept at identifying unimportant but potentially salient units as being unimportant, while showing impairment in identifying accurately units high in structural importance.

It should be kept in mind, however, that ratings of what was important and what was salient were made by the college students and these ratings served as the benchmark against which the accuracy of the retarded pupils was ascertained. It may be that the college raters were relatively inaccurate in guessing what would be interesting or salient to retarded students. If this was the case, then predictions of retarded learner selective attention to unimportant but salient idea units would have been predicated on faulty saliency ratings. Perhaps a future study should contain independent mentally retarded ratings of stimulus saliency which would then be compared against the college ratings of saliency to see the degree of agreement between the two groups of raters.

Another possible explanation for the relatively accurate ratings of the retarded learners may be found in the type of experimental task utilized. The Zeaman and House (1963) and Fisher and Zeaman (1973) selective attention hypothesis was based upon findings taken from nonsemantic, relatively nonmeaningful, laboratory tasks in which the learners were unable to use outside world knowledge or strategies. However, the current experimental task involved a semantic, meaningful, and largely academic task in which the subjects might have had at least some experience. Thus, in this task, the subjects might have been able to bring in past learning, competencies, and strategies which aided them in paying less attention to noncritical task dimensions than they would have in a laboratory nonsemantic task. Clearly, additional research is needed on the ability of retarded learners to selectively attend to relevant task dimension in prose. Such research is necessary before general conclusions can be reached as to the adequacy of the

selective attention hypothesis in explaining learning.

Recall

The experimental comparisons allowed examination of the effects of making ratings of structural importance on recall. In addition, the effects of warning that part of the experimental task involved recalling the story, and informing subjects that making ratings of structural importance accurately facilitated recall was also measured. Finally, comparisons were made with a nonretarded control group which received none of the experimental treatments. The extent which the retarded learners in each experimental group approximated the recall performance of the nonretarded pupils indicated the relative success of the experimental variables in facilitating remembering.

Not surprisingly, the nonretarded learners were superior to each of the mentally retarded groups in total recall of the story. The nonretarded pupils recalled a mean of 65% of the story with no retention interval. This represented the remembering of approximately 35 of the 54 idea units of the story. By comparison, the recall performance of the mentally retarded students in the control group indicates extremely poor remembering of the story. This group (Group 2), which received none of the experimental variables, recalled only 35% of the story. Thus, as expected, there was a substantial difference in the base rate of remembering between the mentally retarded and nonretarded learners.

As shown by the recall data, informing students of later recall requirements of the task did not facilitate story recall. Likewise,

telling learners once that an accurate use of structural importance in text can facilitate recall did not facilitate the remembering of the story. Mentally retarded learners in those groups who were told that they would have to remember the story at a later time apparently were unable to generate on their own a cognitive strategy that would facilitate recall. Similarly, students told at the beginning of the rating task that an appropriate use of the differing levels of structural importance in text could facilitate recall were also unable to convert this information into a strategy that would facilitate recall. Thus, for these students, informing them once of processes which could be converted into facilitative metacognitive strategies did little to aid recall of the story.

Unlike the group which received instructions only once as to usefulness of making judgments about importance, the students who received repeated and intermittent instructions to use importance as a recall strategy showed higher retention of the story than any of the other mentally retarded groups. This group recalled almost half of the story. The recall rate of the high emphasis group (Group 6) thus represents a substantial increase over all of the other mentally retarded groups except for Group 3, and the level of performance represents a 14% increase in remembering over the mentally retarded control group. The difference in remembering between the group that received repeated and intermittent instructions to judge importance and the group which received importance instructions only once suggests a probable production deficit rather than a mediational deficit (Flavell, 1971). According to Flavell (1977), a production deficit occurs when the individual possesses the strategy in question in his/her response

repertoire but cannot use it spontanously. On the other hand, a mediational deficit is said to exist when the subject cannot utilize the strategy even when the strategy is externally cued by the teacher or experimenter. Thus, a mediational deficit would have been hypothesized if both of the retarded groups who received structural importance instructions had performed comparably. However, since the group which received repeated cuing to use importance judgments to aid recall performed significantly better than the group which received instructions only once, a production deficit may be inferred. Based on these findings, it would appear that the strategy of focusing on importance judgments is a trainable one for mentally retarded learners.

The differential recall pattern between importance levels across the experimental groups indicated that for all levels of structural importance, the experimental variables which differentiated the groups were significant factors in recall. That is, for units of the three importance levels, the experimental group which expected recall and which received repeated instructions as to the utility of making appropriate importance ratings in recall, remembered significantly more of all importance levels than any group of mentally retarded individuals. Likewise, when the importance levels of the idea units was investigated, learners recalled more units rated by college judges to be high in importance or of medium importance than of units rated to be low in structural importance. This finding is interesting in light of the earlier analysis of the ratings showing that the mentally retarded students were better in identifying units that were low in importance than in identifying the units that were high in importance. Thus, this finding of enhanced recall for units judged by the college

raters to be high in structural importance suggests that although the retarded students could not reliably rate high importance units, they nevertheless were adept at recalling them. The finding that the students were better in recalling units high in importance than they were in rating them is similar to Brown and Smiley's (1977) outcome. In their study, Brown and Smiley found that third-grade, nonretarded children were adept at recalling units by differing levels of structural importance even though they could not accurately differentiate among the various levels of importance in their ratings. It may be that both mentally retarded individuals and third-grade pupils can recall what is important even though they may be unable to accurately abstract the main ideas from discourse. Furthermore, since this effect held for the four retarded groups which made importance ratings, this phenomenon may be independent of the training procedures used in the present study. Thus, it may be that the ability to recall the main ideas of discourse is a memory feature which need not be trained. However, before such a conclusion can be reached, students who are not yet in third grade and mentally retarded students younger than the age of 10 should be exposed to the current experimental procedures to ascertain if this abstracting ability is simply a trainable skill which was learned by the children earlier in their developmental periods.

Finally, it is interesting to note that analysis of the data revealed that the pattern of increased recall for important thematic material held for units rated high in importance by the retarded students as a group when those units were actually low in importance. That is, the group of 64 retarded individuals demonstrated a higher accuracy rate for recalling units which they rated as being important

than units which they rated as being low in structural importance. Thus, even in cases where the retarded students had actually rated a unit inappropriately in terms of the importance level of that unit, the subjects recalled units that they had rated as highly important better than units rated low in importance. This implies that perhaps what is important in recalling abstracted text is not the actual importance levels of the units as they were designed by the author and appeared in text, but rather the perceived importance by the readers. Thus, in cases where the author and the readers disagree on what is important and unimportant in text, it may be that the reader's perception would win out. Like beauty, structural importance may be in the eye of the beholder.

Implications for Further Research

This study endeavored to answer certain questions regarding the comprehension and recall processes of mentally retarded students. Past investigations into the memory capabilities of mentally retarded individuals have focused on memory for isolated and nonsemantic stimulus materials rather than memory for discourse. The present study, in contrast, focused on the learning and remembering of meaningful content. As such, the learning materials used in the present research appear to be more educationally relevent and ecologically valid than the stimulus materials used in most previous research.

The finding that the mentally retarded pupils in this study performed better than expected in identifying idea units of differing

importance levels holds implications for further research in this area. Perhaps educators now have begun to emphasize higher level inferential comprehension processes rather than literal recall (e.g., Carroll, 1972). If so, such instructional efforts may have achieved some success in improving students' ability to accurately identify what is unimportant and subordinate in discourse. However, the students' inability to accurately identify what is important and superordinate indicates that additional research is needed to determine the types of instructional activities that are required to develop such abilities.

In the present study, the high emphasis group (Group 6) recalled significantly more of the story than the low emphasis group (Group 5). The differential success may be attributed to the fact that Group 6 was repeatedly reminded of the facilitative effects of structural importance on recall. Although this procedure may have its counterpart in the special education teacher's constant admonishments to use this or that strategy, future research might well strive to uncover more valid and efficient training procedures. As suggested by the present outcomes, mentally retarded students show a production deficit in using structural importance to facilitate recall. If so, more efficient methods must be developed to make sure that the student incorporates the selecting and recall of important ideas into his/her comprehension routines.

Finally, the stimulus materials used in the present study dealt with content that was familiar to the lives and knowledges of the students. Such material contrasts sharply with the more obscure content used in studies such as Brown and Smiley (1977). When

familiar content is encountered, the retarded individuals apparently can use their everyday knowledges in comprehending and recalling the material to be learned. However, with new and unfamiliar prose content, the retarded students may not possess the knowledges that allow them to differentiate the various levels of importance. Given such circumstances, curriculum developers clearly might profit from the development of methodology for assessing cultural familiarity of instructional materials.

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